SALVAGE
Exploring, Designing, and Building with Reused Materials

Rotor
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To me a lush carpet of pine needles or spongy grass is more welcoming than the most luxurious Persian rug.

Helen Keller

Forests were the first temples of the Divinity, and it is in the forests that men have grasped the first idea of architecture.

François-René de Chateaubriand

We have learned that mother trees recognize and talk with their kin, shaping future generations. In addition, injured trees pass their legacies on to their neighbors, affecting gene regulation, defense chemistry, and resilience in the forest community.

Peter Wohlleben, The Hidden Life of Trees (2017)
So where are we now? Well, in terms of reclamation the world has gone backwards. Salvage used to be fairly easy and popular. The quantity of reclaimed building material reused in new modern sustainable and eco-friendly buildings is now miniscule. While demolition has increased, reuse has decreased. Indeed, a five star rated green building is allowed to have no reclaimed building material at all.

Thornton Kay, on Salvoweb.com

In the UK today, 90% of materials are “recovered” from the construction and demolition industry, but only 1% of material is recirculated after its first use. Although a large proportion of components are technically reusable, the vast majority end up being either down-cycled or landfilled. This results in a high environmental impact, and a considerable loss of economic value.

Rotor has taken on the challenge to double, by 2032, the amount of recirculated building elements in Northern France, Belgium, the UK and the southern Netherlands. This territory houses thousands of companies specialised in the reclamation and supply of recovered building elements. Despite their obvious potential for the circular economy, these operators are facing important challenges. For instance: visibility, access to markets, or a fluid integration into contemporary building practices. In the context of a European grant application (Inter-reg), Rotor has partnered with technical institutions, trade associations, research centres, architecture schools and public administrations. The effort is rooted in earlier initiatives that were started up, successfully, in Brussels. The ambition, in the long term (2032), is the diversion of 1.75 million tons of waste on top of the baseline, thus creating a value of €300 million or 4,000 new jobs.

The effort will require the participation of a wide range of protagonists in the building sector: deconstruction professionals, materials suppliers, commissioners, consulting engineers, etc. Among these, architects hold a particular position. As authors of building specifications, they choose which materials to prescribe in their projects and thus hold the key to whether or not salvaged goods can find second lives.

To make this a common practice, we think that within a 20-year period it should be as easy for an architect to prescribe a salvaged material as it is today to prescribe a new material.

This unit at the AA started in 2018 as a preliminary investigation with a focus on the UK. The research will be carried on this year.
Why reuse?

In a crisis we would immediately adopt all of these [reuse] strategies, to conserve the value in existing materials. In our economy at present, manufacturing is so efficient that any reuse requiring additional labour is unlikely to compete with the use of new material, and therefore most of these options are dormant.


Reusing building elements is often seen as a key feature of a future circular economy in the EU. In many policies, it is a top priority strategy (e.g. Directive 2008/98/EC on waste). In practice, we see that most efforts in the last decades to ‘close the loops’ in the building sector were limited to the promotion of recycling processes which imply crushing or melting materials. Yet there are good reasons to develop reuse. Life-cycle analysis (LCA) studies reveal that reclaimed elements often have a drastically lower environmental impact compared to newly produced equivalents. Reuse preserves most of the economic value, technical qualities and cultural significance of a building product. It also generates locally rooted economic activities.

Today in north-western Europe the circulation of reclaimed building elements is mainly performed by small and medium-sized enterprises (SMEs) occupying a discrete segment of the building industry. In the countries involved in this project (Belgium, Holland, France, the UK), some 2,200 companies facilitate the reuse of 1.2 million tonnes of building components each year. In comparison, this amount represents 1.1% of the total construction and demolition (C&D) waste generated in the same territory. Reclamation activities generate €250 million per year, directly sustaining 3,000 full-time equivalents, and involve 15,000 people in total. Despite their evident significance to the circular economy, these operators face important challenges:

1. **lack of visibility.** Specialists in dismantling, preparing and supplying reclaimed products are generally overlooked by building professionals. As a result, they operate in a niche market, when their products and services could be applied to large-scale projects as well.

2. **low recovery rate of reusable elements.** The current practices in demolition favor the sorting of C&D waste flows, but lack a strategy to manage reusable elements. As a consequence, large quantities of potentially reusable elements are being discarded as waste.

3. **a weak demand for reclaimed products.** Today, the demand for reclaimed products often remains limited to small-scale projects, because no methods have been developed to integrate reused components in formal contexts such as public tenders or technically demanding applications.
Spolia / Opalis

[...] In the context of the prolific production and consumption of commodities in mid-twentieth-century America, the reuse of consumer products was negatively charged with implications of backwardness and social marginality. New products made of newly manufactured materials were promoted as more efficient, cleaner, safer, and more aesthetically appealing. If the discarded products of this and other hyper-productive societies were reused, it was elsewhere, on their own impoverished peripheries, or in the so-called Third World. By the end of the century, however, concern for managing the waste created by the constant replacement of once-new products by ever newer ones was reversing the negative charge one reuse and investing it instead with positive moral value. Yet because the “psychology of abundance” that accompanied the earlier “throwaway spirit” is still prevalent, reuse is noticeably non-conformist, exceptional, and ideological, rather than systemic and neutral.


Spolia is the term that has been used by archeologists and historians since the Renaissance to designate fragments of Greek and Roman monuments that were salvaged and reused, by subsequent cultures, in new buildings. The term was also applied to architectural salvage and reuse in later eras. Yet the notion bears an explicitly negative connotation because of its association with the idea of spoliation (the act of ruining, robbing or destroying something). The focus is on the loss of the original rather than on the smart reintegration into a new compound.

When Rotor set up, in 2012, the project of an on-line for inventory of all professional resellers of salvaged building materials in Belgium, the idea was to refer to the notion of spolia, without suffering the negative connotations. That’s why it was decided to use an anagram, OPALIS sounded neutral enough.

Constantly updated since 2012, and gradually extending beyond the Belgian territory, the online guide opalis.be now lists more than 120 professional suppliers in second-hand building materials from Belgium, South-Holland and France. The idea of the project is to map out, on behalf of architects and commissioners on the lookout for batches of quality reclaimed materials, companies that can supply trustworthy building materials, competently salvaged from buildings slated for demolition. These companies offer quality guarantees and remanufacturing services for a smoother integration of the goods in a new building. The Opalis database is the outcome of an extensive field research where every reseller has been visited and interviewed.

Opalis’ vocation is:
- to familiarize building professionals with these companies, to advertise their individual competences and expertises
- to federate the salvage industry, which, until now, has hardly been able to push its own agenda
- to provide inspiring examples and concrete tools meant to facilitate the integration of reused components in new projects
Hooke Park is a collection of experimental buildings, constructed from the trees that surround them. This is Hooke Park — the extraordinary woodland campus of London-based architecture school The Architectural Association, or “the local Space Odyssey”, according to my taxi driver.

Financial Times, Emily Rhodes, December 21, 2018

Hooke Park, an ancient woodland in Dorset in the west of England, has long been a real-world laboratory for building projects. For the past 30 years, a strong correlation between sourcing, processing and assembly of building material has been at the core of the campus’s design development. This approach was introduced with its institutional aim to “research, demonstrate and teach the better use of forest produce” and it is materialised today in the current structures that occupy the site, from original buildings by Frei Otto to the lastest addition by the AA’s Design and Make program. The result is the AA forest campus with its pavilions, workshops, and warehouses.

Most of the structures use timber from Hooke Park itself, using innovative design and construction methods that deploy advanced digital modeling and performance analysis for timber just as they would with a synthetic material.

We propose to extend the remit of Hooke Park by adding to its repertoire reused material foraged from the UK. We will get familiar with Dorset’s local material resellers network and will be exploring sources of materials that are already adjacent to the site, such as the Jurassic Coast and the famous isle of Portland with its quarry which stones contributed to London’s most emblematic buildings.

The unit aims to pursue the tradition of exploring forms of occupation and self-sufficiency in Hooke Park. How should the campus continue to grow and inhabit the forest? What does it means to work with the wood as a natural and artificial context to survey and preserve? How can we calibrate our impact on the ecosystem while enriching the site with cultural value?
Studio aims / year overview

Whatever the pleasures and prodigious efforts associated with erecting architecture, the art of causing it to disappear can be equally compelling or satisfying.

Keller Easterling, Subtraction, p. 1.

In any urban society there is a massive stock of available materials from demolition and industrial waste that is currently discarded but has potential value. Although the infrastructure to locate and use these resources is currently lacking, some industry leaders are establishing design strategies, materials recovery processes, construction management approaches and manufacturing systems to create innovative new ways of using them in the built environment.


The aims of the studio are twofold and interlinked.

The first effort builds on the unit’s work last year, letting students start a design process from scouting for materials and resellers in the UK. This effort will contribute to mapping the existing building material reuse sector in the UK through opalis.ac.uk. This platform is intended to increase the accessibility of reused materials for architects, developers, and commissioners. This knowledge will directly inform students’ design proposals.

The second effort runs simultaneous with this research and involves spending time at Hooke Park, developing a brief for a (potentially temporary) structure there composed of reused materials, and eventually building a 1:1 prototype of part of the structure, or potentially all of it. Not only will all materials be second hand / already-used, the goal will be zero waste during assembly too.

In the first term, students will forage for sources of reused material that can inform their proposed scenario and structure for Hooke Park. Site visits across the UK will allow for detailed documentation of a selection of companies and operations. The focus will be on the array of materials available at the different resellers, their provenance, their qualities, and their potential for use in Hooke Park. By the end of the term, the students will update and upgrade the opalis.ac.uk platform, select particular materials to and supplier to work with, and develop a brief for a structure or structures at Hooke Park.

During the second term, design development will go hand in hand with deeper research into the technical capabilities, construction techniques, and procurement process for their chosen materials. This will involve analysing the operations involved in identifying, aggregating or dis-aggregating, and transporting materials, assembling them, and, potentially, dismantling them afterwards.

During the third term, students will refine and complete design work for their structure composed of reused materials. If realization is feasible, they will project manage and construct their design in Hooke Park – and potentially dismantle it or leave instructions for future dismantling. If only one or a handful of projects can be built for financial, logistical, or spatial reasons in Hooke Park, there is the potential for group collaboration and personal outcomes where every student will record, report and interpret specific moments or parts of the structure.

The final design will integrate the knowledge accumulated through field research, through conversations with resellers and other experienced professionals, and through constant feedback from the studio supervisors and peer students.
Term 1

Sourcing reclaimed materials.
Developing design brief for Hooke Park.


It would not serve my purpose to describe in detail any fictional community of the future. I want to provide guidelines for action, not for fantasy. A modern society, bounded for convivial living, could generate a new flowering of surprises far beyond anyone’s imagination and hope. I am not proposing a Utopia, but a procedure that provides each community with the choice of its unique social arrangements.


During the first term, the start of design thinking will go hand in hand with research into material sellers. Students will be introduced to the topic: what is building component reuse? Where did it originate, why has the tradition been lost? Why would it make sense to push reuse today? What are the major obstacles, from an economic, sociological and design point of view? This introduction will also present the work that Rotor has conducted in Belgium and France to galvanise the reuse sector. The digital platform Opalis, which summarizes much of these efforts, will be analyzed in detail.

A. Road trip & opalis

The first set of assignments for this term will send out the students, in groups of 4, to roam the British countryside. Students will visit a substantial number of companies engaged in the reuse, repair and reconditioning of salvaged building components. The purpose of this ‘Safari’ is to scout for batches of building components and materials that could directly inform their design proposals and also to dialogue with professional resellers and other key economic protagonists that can address part of the needs for new occupation prototype at Hooke Park. This survey will be conducted through interviews, photography, note-taking and artefact collection. The student groups will report, on a weekly basis, to the tutors and the other groups. Modes of investigating, questioning, and reporting will be constantly and collectively monitored.

The concrete results of the investigation will be fed into Opalis.co.uk, a website meant to become a well-established portal for the reuse sector in the UK. Students will be briefed on how to write succinct but complete presentation sheets of the visited businesses, including a carefully edited photographic report.

B. Hooke Park visit & brief

Students will spend several days at Hooke Park, where studio sessions and workshops will take place. Students will learn the qualities, needs, and possibilities of Hooke Park through understanding the context and larger conversation with AA tutors and staff based there as well as the director’s office and the London campus. Students will develop a brief for a potential new structure, or structures, to be built out of reused materials identified during their field trips. Based on the knowledge that they have gained about local ressources, processes and the salvage industry, they will start assembling prototype working with found samples of materials. These projects will likely explore the potential for temporary accommodation for visitors and workers at Hooke Park.
Term 2

Design development
Material & technical research
Supply chain & construction planning

11 weeks (06.01.20 - 22.03.20)

We can see our forests vanishing, our water-powers going to waste, our soil being carried by floods into the sea, and the end of our coal and our iron is in sight. But our larger wastes of human effort, which go on every day through such of our acts as are blundering, ill-directed, or inefficient, and which Mr. Roosevelt refers to as a lack of "national efficiency," are less visible, less tangible, and are but vaguely appreciated.


During the second term, students will develop designs based on their brief and early prototypes. This process will be integrated with deeper research, building on the fieldwork and experimenting of term 1, into the capabilities of their selected materials, and how to procure, transport, and assemble them in Hooke Park.

Students at this point may agree to collaborate on a single project or a limited set of projects to be realized / prototyped in Hooke Park. Meanwhile others can develop speculative projects.

Through research in literature and additional interviews with stakeholders (demolition contractors, retailers, building contractors, designers, technical experts), all students will map the supply chain for their materials, from its source until its potential reuse, and identify possible process bottlenecks. These could be the critical absence of certain middlemen, logistic challenges, economic feasibility, legal or psychological (taste) hurdles, etc.

They will simultaneously discover technical and structural capacities, longevity, climatic performance, and dismantlability.

The focus will lie on the development of an optimal, judicious and elegant architectural application for the element/material in question, in the form of an assembly system ready for integration in new projects.

At the end of the term, the students will have a detailed design, technical knowledge, and, where appropriate, a plan for construction.
Term 3

Design refinement & completion
Construction in Hooke Park

9 weeks (23.04.20 – 21.06.20)

Again: design is basic to all human activities. The planning and patterning of any act toward a desired foreseeable end constitutes the design process. Any attempt to separate design, to make it a thing-by-itself, works counter to the inherent value of design as the primary, underlying matrix of life. Integrated design is comprehensive: it attempts to take into consideration all the factors and modulations necessary to decision-making process. Integrated, comprehensive design is anticipatory. It attempts to look at existing data and trends and to continuously extrapolate, as well as interpolate, from the scenarios of the future it constructs.

Integrated, comprehensive and anticipatory design is the act of planning and shaping carried on across the various disciplines, and act continuously carried on at interfaces between them.


During the third term, the unit’s attention will entirely go to the finalization and/or realisation of an architectural project in Hooke Park that integrates one or several materials and assembly systems as defined during term 2.

Students must coordinate the procurement of their materials, schedule construction phases, organise necessary assistance, and construct the project(s) at Hooke Park.

Students may also (need to) dismantle their structure(s), and plan the future use or resale of their materials.

The project will be grounded in the realities of today’s architectural practice with an understanding of the construction processes involved in the proposal as well as the quantity and nature of labor solicited for its execution. A particular attention will be given to detailing. The project should demonstrate a pragmatic approach of sustainable architecture. The choice of building materials, assembly systems and building engineering options in the project should be fully functional, but also motivated from an economic, social and aesthetic point of view.

Term 3 will be an opportunity for students to translate communal work into personal recording, reporting and interpretation. Every student will take the chance to develop and communicate an expertise throughout the course of the exercise.


